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**From:** gary s  
**Sent:** Thur 12/26/2013 7:54:32 PM  
**Subject:** RE: Soil Testing on Passaic Riverbank in Kearny NJ.

Thanks Tim, and thanks again for your time on the phone.

I just got through this reading and I hope to get the bioassay testing going. and can you share the full articles from **Legind & Trapp** (2009) and **Engwall & Hjelm** (2000) so that we might use them in guiding our planting??

Sounds like we will be staying the course in terms of planting with the strawbales and maybe adding barriers beneath the bales to stop the roots from reaching the soil. perhaps there should be some public education from our garden about washing the edibles and our ongoing testing. Seems logical that we might also do the bioassay on some of the veggies we grow and then some store bought veggies of same type.

thanks!  
garyS

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From: tim\_kubiak@fws.gov  
Date: Mon, 23 Dec 2013 14:33:39 -0500  
Subject: RE: Soil Testing on Passaic Riverbank in Kearny NJ.  
To: garys-nj@hotmail.com; yeh.alice@epa.gov; lisa.a.baron@usace.army.mil; reyhan.mehran@noaa.gov; janine.macgregor@dep.state.nj.us

Hello Gary,

I have included below a few annotated citations from the scientific literature. Urban soils are generally more contaminated than rural soils. In a local study, **Freidman** et al., (2011) estimated almost half of the dissolved TCDD from the Passaic River was volatilized from Newark Bay into the local atmosphere during the growing season. Since food crops pick up most of their TCDD from the atmosphere, locations high in atmospheric TCDD may present a higher risk of garden vegetable contamination than rural areas. From the work of **Legind & Trapp** (2009) below, leafy vegetables generally and lettuce specifically, accumulate much more than rooted vegetables, including potatoes. However, **Engwall & Hjelm** (2000) found carrots to be the highest contamination among the plants tested. If you have a local spruce tree in the neighborhood, its needles could be a good long-term sampling matrix (see below: **Iozza** et al., 2009

and **Sinnkonen** et al., 1997). From an analytical perspective, there are commercial bioassay services that can do something similar to what Engwall did. Extracts containing the dioxin and related compounds can be reported as the total dioxin-like contamination from the sample. This is the most cost-effective way to start if interested. Last time I checked, the cost was around \$300.00 per sample.

**Engwall**, M. and K. Hjelm (2000). "Uptake of dioxin-like compounds from sewage sludge into various plant species ± assessment of levels using a sensitive bioassay." *Chemosphere* 40: 1189-1195.

A bioassay for the detection of dioxin-like compounds was used to estimate uptake of dioxin-like compounds in carrots, oil seed rape seeds, zucchinis and cucumbers grown in soil amended with sewage sludge from Swedish sewage treatment plants (STP). This sensitive bioassay is based on 7-ethoxyresoru®n O-deethylase (EROD)-induction in cultured chicken embryo livers and reflects the combined biological effect of all dioxin-like compounds in a sample, including ones that seldom are analyzed. The bioassay detected low concentrations of dioxin-like compounds in all carrot, zucchini and cucumber samples, but did not detect any dioxin-like compounds in the rape seeds. In carrots the concentrations were increased up to seven times when grown in soil amended with high applications of some of the sludge samples, while others did not increase the concentrations compared to control. More realistic sludge applications only increased the concentrations slightly. The sludge-fertilized carrots contained the highest concentrations of the investigated plants (up to 14 pg bioassay-derived TCDD equivalents (bio-TEQs)/g d.w.). In the carrots, differences in uptake of dioxin-like compounds depended on the sludge origin, which may be due to more easily bioaccumulated dioxin-like compounds in some sludge samples, or other components that facilitated uptake into the carrots. In the cucumbers, a more than two-fold increase (from 0.2 to 0.5 pg bio-TEQs/g d.w.) was observed in specimens grown in sludge-amended soil when compared to controls, suggesting a small uptake from the roots to the shoots. No sludge-dependent increase in uptake was seen in the zucchini fruits. The bio-TEQ levels were generally low in the consumable above ground plant parts of the investigated species. However, the question if repeated sludge application results in a soil accumulation of dioxin-like compounds, thereby increasing the risk of plant uptake, remains to be investigated.

**Friedman**, C. L., M. G. Cantwell, et al. (2012). "Passive sampling provides evidence for Newark Bay as a source of polychlorinated dibenzo-p-dioxins and furans to the New York/New Jersey, USA, atmosphere." *Environmental Toxicology and Chemistry* 31(2): 253-261.

Freely dissolved and gas phase polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) were measured in the water column and atmosphere at five locations within Newark Bay (New Jersey, USA) from May 2008 to August 2009 with polyethylene (PE) passive samplers. Mono- to octa-CDDs and mono- to hepta-CDFs were detected in bottom and surface waters at  $\leq 20$  pg/L with no clear gradient between sampling locations, suggesting freely dissolved PCDD/Fs are well mixed in Newark Bay. The most concentrated, freely dissolved gas phase congener was 2,7/2,8-dichlorodibenzo-p-dioxin (2,7/2,8-DiCDD), likely originating from photochemical conversion of triclosan in Newark Bay. Air-surface water gradients strongly favored net volatilization of PCDD/PCDFs from Newark Bay. Water-to-air fluxes of 2,7/2,8-DiCDD and 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD), the most concentrated and the most toxic PCDD/PCDFs, respectively, were approximately 60 ng/m(2) per month and 14 to 51 pg/m(2) per month. Significant decreases in freely dissolved 2,3,7,8-TCDD concentrations with increasing freshwater near the Passaic River and conservative behavior during the summer of 2009 suggested Passaic sediments as a likely source of

2,3,7,8-TCDD to Newark Bay. Mass balance calculations implied that almost 50% of freely dissolved 2,3,7,8-TCDD delivered to Newark Bay from the Hackensack and Passaic Rivers was lost to volatilization in the summer of 2009

**Iozza, S., P. Schmid, et al. (2009).** "Development of a comprehensive analytical method for the determination of chlorinated paraffins in spruce needles applied in passive air sampling." *Environmental Pollution* 157(12): 3218-3224.

Conifer needles are used for the monitoring of atmospheric persistent organic pollutants. The objective of the present study was to develop a method for the detection of airborne chlorinated paraffins (CPs) using spruce needles as a passive sampler. The method is based on liquid extraction of the cuticular wax layer followed by chromatographic fractionation and detection of CPs using two different GCMS techniques. Total CP concentrations (sum of short (SCCP), medium (MCCP) and long chain CPs (LCCP)) were determined by EI-MS/MS. SCCP and MCCP levels as well as congener group patterns (n-alkane chain length, chlorine content) could be evaluated using ECNI-LRMS. For the first time, data on environmental airborne CPs on spruce needles taken within the Monitoring Network in the Alpine Region for Persistent and other Organic Pollutants (MONARPOP) are presented providing evidence that spruce needles are a suitable passive sampling system for the monitoring of atmospheric CPs.

**Legind, C. N. and S. Trapp (2009).** "Modeling the exposure of children and adults via diet to chemicals in the environment with crop-specific models." *Environmental Pollution* 157(3): 778-785.

Exposure to chemicals via diet is a major uptake pathway for many compounds but is often estimated in a rather generic way. We use a new model framework (NMF) with crop-specific models to predict the dietary intake by 4-5-year-old children and 14-75-year-old women of three environmental compounds from their background concentrations in soil and air. Calculated daily intakes of benzo(a)pyrene and 2,3,7,8-TCDD are in good agreement with measured results from diet studies. The major source of both compounds in human diet is deposition from air. Inhalation of air and ingestion of soil play a minor role. Children take up more than twice the amount than adults per kg bodyweight, due to higher consumption per kg bodyweight. Contrary, the methods for indirect human exposure suggested in the Technical Guidance Document (TGD) for chemical risk assessment in the EU lead to overprediction, due to unrealistic consumption data and a false root model.

**Kaupp, H., M. Blumenstock, et al. (2000).** "Retention and mobility of atmospheric particle-associated organic pollutant PCDD/Fs and PAHs in maize leaves." *New Phytologist* 148: 473-480.

The fate of polychlorinated dibenzo-p-dioxins and dibenzofurans and polycyclic aromatic hydrocarbons deposited to maize leaves under ambient conditions was investigated, with focus on those compounds that are primarily associated with particles in the atmosphere. Leaf samples collected from mature maize plants over an 8-wk period were subjected to four extraction procedures: (1) rinsing with distilled water; (2) shaking in aqueous EDTA solution; (3) immersion in chloroform-methanol; (4) soxhlet extraction with toluene. Of the compounds deposited primarily in association with particles, "20% of the total leaf contamination was present in the first two aqueous extracts, indicating that only a small

portion of these substances was subject to ready erosion from the leaf surfaces. Some  $50\pm 60\%$  of the chemical was present in the third extract, while  $20\pm 40\%$  was found in the final extract. The chemical in the final extract was no longer associated with particles, since these had been removed with the first three extractions. This chemical must have desorbed from the particles with which it was originally deposited, and migrated through the epicuticular waxes. Model calculations indicated that  $15\pm 35\%$  of the chemical in the third extract had also desorbed from the particles, and there was evidence that polychlorinated dibenzo-p-dioxins and dibenzofurans desorb more readily than polycyclic aromatic hydrocarbons. It is concluded that desorption of chemical from particles and subsequent transport through the cuticle is an important process determining plant accumulation of organic contaminants associated with atmospheric particles.

**Sinkkonen**, S., N. Kamarainen, et al. (1997). "PCDDs, PCDFs, PCDTs, PCBs and some other organochlorine compounds in pine needles exposed to pulp and paper mill emissions and effects of waste combustion on the concentrations." *Chemosphere* 35(10): 2193-2202.

Concns. of semivolatile chlorinated org. compds. .alpha.-HCH, lindane, HCB, DDT, DDE, DDD, chlordanes and PCBs, and low-volatility compds. PCDDs, PCDFs and PCDTs in pine needles in a recipient area of the emissions from a pulp and paper mill where also waste combustion was done were measured. Mostly, the concns. were found to be near the background levels. Elevated concns. of HCB, some PCB congeners and some HxCDF isomers in samples from two sampling points were obsd. Some other possible point sources of these compds. are situated in the vicinity of the pulp and paper mill.

Generally I support what EPA already provided to you. Just washing vegetables may not provide full risk protection however (see **Kaupp** et al., 2000).

Happy Holidays,

Timothy J. Kubiak

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**Sent:** Sunday, December 22, 2013 11:08 PM

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**Subject:** RE: Soil Testing on Passaic Riverbank in Kearny NJ.

Hi!

I'll call each of you tomorrow and I'm sorry for not following up sooner but can you bubble this up to the top of your action pile? At least to talk about it?

thanks in advance.

gary schetlick

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Subject: Soil Testing on Passaic Riverbank in Kearny NJ.

Date: Fri, 6 Dec 2013 11:15:12 -0500

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hello -

I'm involved with a community garden in Kearny nj on the banks of the Passaic river. I know that this area of the Passaic River is heavily contaminated with a variety of hazardous substances, including dioxin, PCBs, mercury, DDT, pesticides and heavy metals and our Kearny Community Garden falls within the [Lower Passaic River Restoration Project](#) Study Area. I found below report which indicates that areas that have flooded around the polluted sections of river are not dangerous for people to use. But the report doesn't address growing edible

vegetables in the soil...

Can you comment or advise? I believe that the river has flooded this area on some rare occasions (hurricane sandy) but definitely not often.

[http://www.epa.gov/region02/superfund/npl/diamondalkali/pdf/soilsamp\\_report.pdf](http://www.epa.gov/region02/superfund/npl/diamondalkali/pdf/soilsamp_report.pdf)

I also understand it is possible the soil might not be safe for planting because of contamination from businesses that no longer exist on the property (I don't know that there was ever any businesses there but I guess it's possible). So in this light, we should have the soil tested.

Seeing as our Kearny Community Garden is located within the Lower Passaic River Restoration Project Study Area and the Lower Passaic River Restoration Project is a partnership designed to restore degraded shorelines, restore and create new habitats and **enhance human use** along this 17-mile stretch of the lower Passaic, can you advise on planting there and are there any free soil testing options??? The Kearny Community Garden is already a successful beautification project and so joining forces only makes sense as the Kearny Community Garden is exactly that which the Lower Passaic River Restoration Project was designed to create. We are your success story.

Thanks in advance for your timely response. Please note that we are already planning and raising funds for Spring Planting and so the completion of this soil testing milestone is becoming urgent. In this light, we may be pursuing other testing options but feel working within the Lower Passaic River Restoration Project is the best solution.

best regards,  
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